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Comparison of laparotomy and laparoscopy in hysterectomies for benign uterus diseases

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ABSTRACT

Aim: To compare the difference between laparoscopic (L/S) and laparotomic (L/T) hysterectomies and the addition of oophorectomy to surgery by complications, blood transfusion, and changes to hemoglobin (Hb) levels and explore the impacts of diabetes mellitus (DM), smoking, previous abdominal surgery, and body mass index (BMI) on early and late complications.

Methods: We recruited 537 patients for this retrospective cross-sectional study. The patients were initially divided into two groups: L/S and L/T and were further divided into subgroups by the addition of oophorectomy. We then compared the groups by early and late complications, changes to Hb levels, and blood transfusion. Moreover, we explored the associations between early and late complications and DM, previous abdominal surgery, and smoking.

Results: The findings revealed that 22.7% of hysterectomies were L/S, and 77.3% were L/T. We concluded similar results between main groups and subgroups. Yet, we could not reach significant impacts of BMI, DM, smoking, and abdominal surgery on complications. Even though postoperative blood transfusion was found to be significantly higher in the L/T group than L/S group (L/S: 0.8%, L/T: 5.8%, p=0.022), it did not significantly differ between the subgroups (Group 1: 3.3%, Group 2: 0%, Group 3: 6.5%, Group 4: 5.5%, p= 0.114). Besides, 6.7% of the patients developed complications. We discovered surgical site infection in 3% of the patients, bleeding and hematoma in 1.6%, and urinary tract injury in 0.9%, while there was only one mortality.

Conclusion: Overall, we could not conclude a significant difference between L/S and L/T hysterectomies for benign reasons, except by postoperative blood transfusion. Moreover, oophorectomy did not contribute to the risk of surgery-related complications and blood transfusions.

Keywords: Adnexal surgery,benign uterine diseases, laparoscopic hysterectomy, laparotomic hysterectomy, gynecological surgery complication

INTRODUCTION

Hysterectomy refers to the surgical removal of the uterus and cervix, and salpingectomy and/or oophorectomy may be considered in the surgery. It seems the most frequently performed major surgery (about 600,000 times annually) following cesarean section (C/S) in the reproductive age in the United States.[1] About 68% of hysterectomies are performed by the abdominal route, most commonly with the indication of leiomyoma (40.7%). Moreover, oophorectomy is accompanied by hysterectomies at 53.8%.[1] It is known that 74% of hysterectomies are for benign indications.[2] It can be performed laparotomic (L/T), laparoscopic (L/S), robotic, and vaginal. The first planned successful vaginal hysterectomy was reported by Lagenbeck in 1817, subtotal abdominal hysterectomy by Kimball in 1855, and total L/S hysterectomy by Reich in 1989.[3,4] Despite vaginal and abdominal hysterectomy attempts until the aforementioned dates, high mortality rates were also reported due to indefinite surgical techniques, lack of vascular ligation, and failure to provide antisepsis.[3] Yet, L/S procedures have gained popularity compared to previous years.[2] However, abdominal hysterectomy still seems to be the most common surgical method despite more extended hospital stay, more postoperative pain, higher infection rates, and delayed return to everyday life.[5] The most common indications for L/T and L/S hysterectomies are leiomyoma and abnormal uterine bleeding, respectively.[6] Moreover, there may be many complications (e.g., infection, deep venous thrombus, gastrointestinal system injury, genitourinary system injury, and bleeding) during the perioperative period of hysterectomy.

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The present study attempted to compare the difference between L/S and L/T hysterectomies and the addition of oophorectomy to surgery by complications, blood transfusion, and changes to hemoglobin (Hb) levels and explore the impacts of diabetes mellitus (DM), smoking, previous abdominal surgery, and body mass index (BMI) on early and late complications.

METHODS

This study was produced from the first author's specialization thesis in gynecology and obstetrics numbered 451277 and titled "Comparison of Laparotomy and Laparoscopy in Hysterectomies Performed for Benign Uterine Diseases."

İstanbul Medeniyet University, Goztepe Education and Research Hospital granted ethical approval to this retrospective cross-sectional study (Date: 01.02.2017 Decision no: 2016/0270). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

We first identified patients undergoing L/S and L/T hysterectomies for benign uterine indications between January 2012 and January 2017 from hospital records. After excluding endometriosis or malignant indications, adnexal masses, conversion from L/S to L/T, and vaginal and subtotal hysterectomies, we carried out the study with the data of 537 patients.

The patients were first divided into two groups: those with L/S (n=122) and L/T (n=415) hysterectomies. Then, they were further divided into four subgroups by oophorectomy. Accordingly, Group 1 had only L/S hysterectomy (n=30, 5.6%), Group 2 underwent L/S hysterectomy with oophorectomy (n=92, 17.1%), Group 3 had only L/T hysterectomy (n=108, 20.1%), and Group 4 was recruited for L/T hysterectomy combined with oophorectomy (n=307, 57.1%). We compared the main groups and subgroups by preoperative and postoperative sixth-hour Hb values (Δ1), preoperative and postoperative first-day Hb values (Δ2), intraoperative and postoperative blood transfusion, and early and late complications. We also evaluated the relationships between early and late complications and DM, previous abdominal surgery, smoking, and BMI in the groups.

We accepted complications occurring intraoperatively and till the end of the seventh postoperative day as early complications and those appearing on the eighth postoperative day as late complications.

Statistical Analysis

We utilized descriptive statistics to present the data. After ensuring the normality of distribution with the Kolmogorov-Smirnov test, we compared categorical data using the chi-square test and Fisher's exact test, while we utilized independent samples t-test and one-way analysis of variance (ANOVA) to compare the parameters between the groups. We ran the Tukey test in multiple comparisons to reveal the source of significant difference(s) between the groups. Moreover, we explored the associations between the continuous variables using Pearson's correlation analysis. All analyses were performed on SPSS 21.0, and a $p< 0.05$ at the 95% confidence interval (CI) was considered statistically significant.

RESULTS

We studied the data of 537 patients, 122 in the L/S group and 415 in the L/T group. We found the mean hospitalization length to be 2.710±0.955 days, the mean age to be 48.150±6.034 years, the mean body weight 71.100±9.460 kilograms, the mean BMI to be 26.820±4.273, the median gravida to be 4 (0-15), and the median parity to be 2 (0-10). Moreover, the findings showed the mean preoperative Hb value to be 11.949±1.441 gr/dL, the mean postoperative sixth-hour Hb value to be 10.931±1.320 gr/dL, the mean postoperative first-day Hb value to be 10.698±1.267 gr/dL, the mean Δ1 to be 1.036±1.037 gr/dL, and the mean Δ2 to be 1.268±1.070 g/dL. Besides, we discovered the subgroups had a similar distribution of BMI values (Group 1=26.0±3.92, Group 2=26.1±4.0, Group 3=27.1±4.4, Group 4=27.1± 4.3; p=0.198).

As indications for hysterectomy, we detected leiomyoma in 345 (62.4%) patients, abnormal uterine bleeding in 67 (12.5%), cervical intraepithelial neoplasia (CIN2, CIN3) in 21 (3.9%), adenomyosis in 39 (7.3%), endometrial pathologies (endometrial polyp, endometrial hyperplasia, tamoxifen use) in 64 (11.9%), and complete mole in 1 (0.2%) patient.

Table 1 shown comparisons of the main groups and subgroups by Δ1 and Δ2. We could not determine significant differences between the main groups and subgroups by Δ1 and Δ2 .

Table 1. Comparisons of the main groups and subgroups by Δ1 and Δ2

Main Groups				
	L/S (Group 1+2) (n=122)	L/T (Group 3+4) (n=415)	t*	p
Δ1	1.158±0.783	1.001±1.099	1.478	0.140
Δ2	1.274±0.748	1.267±1.149	0.082	0.935

Subgroups				
		M±SD	F#	p
Δ1			2.321	0.074
	Group 1 (n=30)	0.940±0.895		
	Group 2 (n=92)	1.229±0.734		
	Group 3 (n=108)	1.149±1.456		
	Group 4 (n=307)	0.949±0.939		
Δ2			1.162	0.324
	Group 1 (n=30)	1.160±0.839		
	Group 2 (n=92)	1.311±0.717		
	Group 3 (n=108)	1.421±1.502		
	Group 4 (n=307)	1.212±0.993		

Δ1: Difference between preoperative and postoperative sixth-hour hemoglobin values, Δ2: Difference between preoperative and postoperative first-day hemoglobin values, (*t-test, #ANOVA)

Table 2 shown blood transfusion and early and late complications between the main groups. We compared the main groups by intraoperative and postoperative blood transfusions and early and late complications. The findings revealed significantly higher postoperative blood transfusions in the L/T group compared to the L/S group.

Table 2. Blood transfusion and early and late complications between the main groups

	L/S (n=122)		L/T (n=415)		p
	n	%	n	%	
Intraoperative blood transfusion	2	1.6%	12	2.9%	0.445
Postoperative blood transfusion	1	0.8%	24	5.8%	0.022
Early complications	4	3.3%	14	3.4%	0.959
Late complications	4	3.3%	14	3.4%	0.959

Table 3 shown blood transfusion and early and late complications between the subgroups. We did not conclude significant differences between the subgroups by intraoperative and postoperative blood transfusions and early and late complications.

Table 3. Blood transfusion and early and late complications between the subgroups

	Group 1 (n= 30)		Group 2 (n=92)		Group 3 (n=108)		Group 4 (n=307)		p
	n	%	n	%	n	%	n	%	
Intraoperative blood transfusion	2	6.70%	0	0.00%	5	4.60%	7	2.30%	0.099
Postoperative blood transfusion	1	3.30%	0	0.00%	7	6.50%	17	5.50%	0.114
Early complications	1	3.30%	3	3.30%	6	5.60%	8	2.60%	0.542
Late complications	2	6.70%	2	2.20%	7	6.50%	7	2.30%	0.124

Among early complications, seven patients developed surgical site infections, six suffered bleeding requiring additional surgical intervention, and five had urinary system damage. As late complications, we detected surgical site infection in 13 patients, vaginal cuff hematoma in three patients, abdominal pain in one patient, and cuff cellulitis in one patient. A 48-year-old patient in the L/T group died of bleeding on the first postoperative day. Surgical site infection, accounting for 38% of early complications, 72% of late complications, and 55% of all complications, was found to be 3% among all patients. Moreover, hemorrhage requiring intervention and surgical-related hematoma, accounting for 33% of early complications, 16% of late complications, and 25% of all complications, were observed in 1% of all patients. Finally, 0.9% of all patients had urinary system damage, accounting for 27% of early complications, 0% of late complications, and 3% of all complications.

Early and late complications were addressed by DM, abdominal surgery, smoking, and BMI. 57 (10.6%) of 537 patients who underwent hysterectomy had a history of DM. Of the 18 early complications, 16 (3.3%) were detected in patients without DM and 2 (3.5%) in DM patients (p= 0.589). We also discovered that, among the 18 late complications, 17 (3.5%) were present in patients without DM and 1 (1.7%) in DM patients (p= 0.411). Moreover, 97 (18%) patients had a history of smoking. Our findings revealed early and late complications to be similar by smoking. Overall, 16 (3.6%) of early and late complications were found in non-smokers, while 2 (2.1%) were detected in smokers (p= 0.340). We discovered that 106 patients had a history of abdominal surgery once, and 59 patients underwent at least two abdominal surgeries. Early complications were observed in 13 (3.5%) patients without abdominal surgery, 4 (3.8%) with abdominal surgery once, and 1 (1.7%) with two or more abdominal surgeries (p=0.747). When it comes to late complications, the above findings appeared to be 14 (3.8%), 3 (2.8%), and 1 (1.7%), respectively (p =0.673). In general, we could not find significant differences among our patients in early and late complications by DM, smoking, and history of abdominal surgery. Besides, we calculated the mean BMI to be 26.82±4.30 for 519 patients without early complications and 27.03±3.50 for 18 patients with early complications (t=0.213; p=0.832). It was found to be 26.86±4.27 for 519 patients without late complications and 25.78±4.30 for 18 patients with late complications (t=1.056; p=0.292). Similar to the other parameters, the patients did not significantly differ in early and late complications by BMI.

DISCUSSION

Our findings revealed no statistically significant differences between L/S and L/T groups and between the subgroups by Δ1 and Δ2, perioperative blood transfusion, and early, late, and total complications. Despite no significant difference between subgroups by postoperative blood transfusion, postoperative blood transfusion requirement was significantly higher in the L/T group compared to the L/S group. Therefore, we can assert that the addition of an oophorectomy did not cause any additional risk. Moreover, we discovered that early and late complications did not significantly differ by DM, smoking, history of abdominal surgery, and BMI. Only one patient died of bleeding on the first postoperative day. Finally, there was surgical site infections in 3% of all patients, bleeding and hematoma requiring surgical intervention in 1%, and urinary tract damage in 0.9%.

Given the patient, surgeon, and hospital conditions, operators may prefer the vaginal route first, L/S second, and L/T third in hysterectomy patients. Salpingectomy can be safely adopted during vaginal hysterectomy.[7] While hysterectomy operations are often 'clean-contaminated,' they may become 'contaminated' in the case of perioperative urinary tract infection or bacterial vaginosis and 'dirty or infected in the case of purulent discharge due to intraoperative bowel perforation or pelvic inflammatory disease.[8] Febrile morbidity refers to body temperature above 38°C in at least two measurements at six-hour intervals starting 24 hours following the surgery. The most common infectious causes are known to be vaginal cuff cellulitis, infected hematoma or abscess, wound site, urinary tract, and respiratory infections. Preoperative antimicrobial prophylaxis depends on factors such as socioeconomic status, BMI, and concomitant procedures. In addition, high fever and leukocytosis can also be caused by non-infectious causes (e.g., atelectasis, hypersensitivity reactions, tissue trauma, or pyrogenic reaction to hematoma).[9] While the infection rate for abdominal hysterectomy is 10.5%, it is often reported to be 9% for L/S hysterectomy.[10] Compared to abdominal hysterectomy, there are lower febrile morbidity rates and fewer wound infections, while vaginal mold infection is higher in L/S hysterectomy.[11]

The ureteral injury is reported to be 1.6 (0-14.6) and bladder injury to be 2.6 (0.2-19.5) per 1,000 gynecological surgeries. Besides, 11.5% of intraoperative ureteral damage and 51.6% of bladder damage could be detected.[12] More urinary tract injury is reported in L/S hysterectomy.

Moreover, bladder, ureter, and urinary tract damage (bladder or ureter) is more common in L/S hysterectomy compared to L/T hysterectomy. Yet, intestinal damage is less in L/S hysterectomy.[11]

Compared to L/T hysterectomy, L/S hysterectomy has more vascular injury, less bleeding, and less pelvic hematoma and blood transfusion.[11] Similarly, more blood transfusion was needed in the L/T group in our study.

While the average hospital stay for abdominal hysterectomy is 3.07 days, it is 1.65 days for L/S hysterectomy.[13] Moreover, patients with L/S hysterectomy can return to their normal 15.17 days earlier compared to those with L/T hysterectomy.[11] A study reported that the rate of abdominal hysterectomy fell from 65% to 54%, while the rate of vaginal hysterectomy decreased from 25% to 17% in 2010 compared to 1998. Moreover, there was a decrease of 36.4% in the total number of hysterectomies in 2010 compared to 2002.[14]

In a study where more than 2 million benign hysterectomy cases were followed up between 1998 and 2006 in the USA, the addition of oophorectomy to vaginal hysterectomy increased complications (OR: 1.12, CI: 0.89-1.17), while there were no changes in abdominal (OR: 0.91, CI: 0.89-0.94) or laparoscopic hysterectomies (OR: 0.89, CI: 0.83-0.94).[15] Similarly, we could not concluded significant differences between L/S and L/T groups with added oophorectomy by complications, which may be because the operations may have been handled by experienced surgeons.

Obesity, DM, and smoking are prevalent risk factors for infection complications.[16-18] In this study, the fact that DM did not increase the risk of complications may have been due to tight perioperative glycemic control. In the preoperative stage, patients are recommended to quit smoking, and, therefore, many patients reduce their daily cigarette smoking. On the other hand, the fact that BMI showed similar distribution between the groups may not have had a significant effect on complications.

In our study, we discovered mortality in only one patient (0.18%). The previous research reported the mortality rate in abdominal hysterectomy to be 0.32-0.5 per 1,000 patients.[17-19] The present study is not free of a few limitations. Studying the data obtained retrospectively, considering operations performed by different operators, inequal numbers of patients in the groups, and lack of exact criteria for choosing the hysterectomy technique (L/S-L/T), and comparing operations for only benign indications may have created major limitations to this study. Moreover, the fact that the operations were performed by experienced surgeons with the help of advanced surgical techniques may have yielded similar complication rates in this study.

CONCLUSION

L/S hysterectomy may be preferred in relevant patients and indications since L/S and L/T hysterectomies demonstrate similar complication rates. The addition of an oophorectomy to either method seems not to contribute to complication risks.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of İstanbul Medeniyet University Goztepe Education and Research Hospital Hospital Ethics Committee study (Date: 01.02.2017, Decision No: 2016/0270).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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